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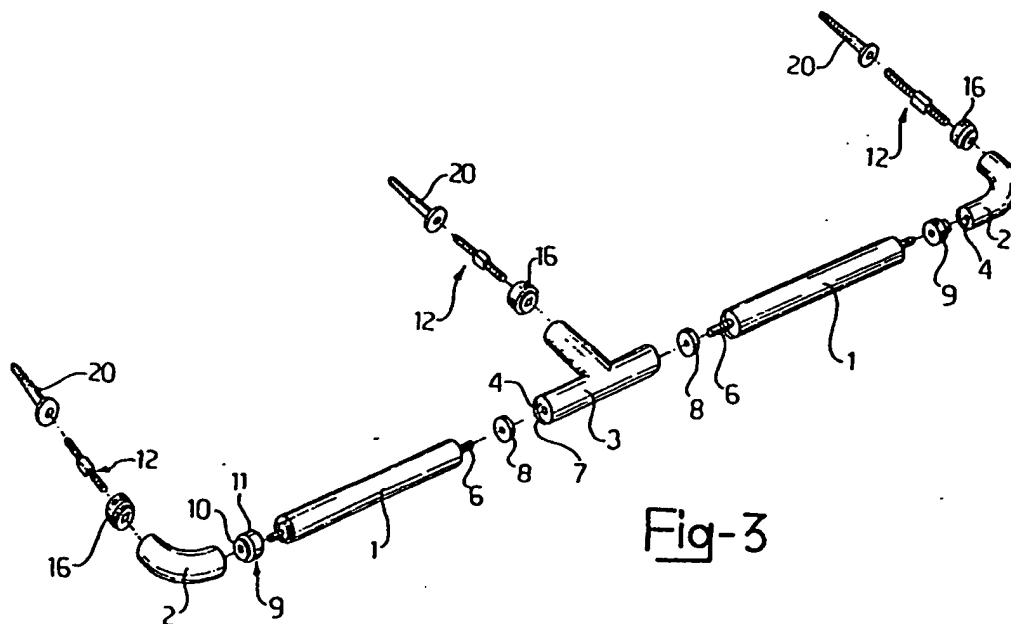
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## (54) Composite tubular structures

(57) A kit for making composite tubular structures, eg handles, or hand rails, comprises a plurality of tubular elements, of which at least one is straight (1), at least one is of elbow-shape (2) and at least one is of T-shape (3), a plug (4) fixed in each end of each tubular element and provided with an axial threaded aperture, a plurality of threaded bars (6) for engagement in the threaded apertures in the plugs to connect the tubular elements in abutting relation, at least one tie rod (12) provided with oppositely threaded ends and an operating ring (16) rigid for rotation with the or each tie rod. The plug (4) may comprise an internally expanding clamping device to grip the inside surface of the tubular element (1).



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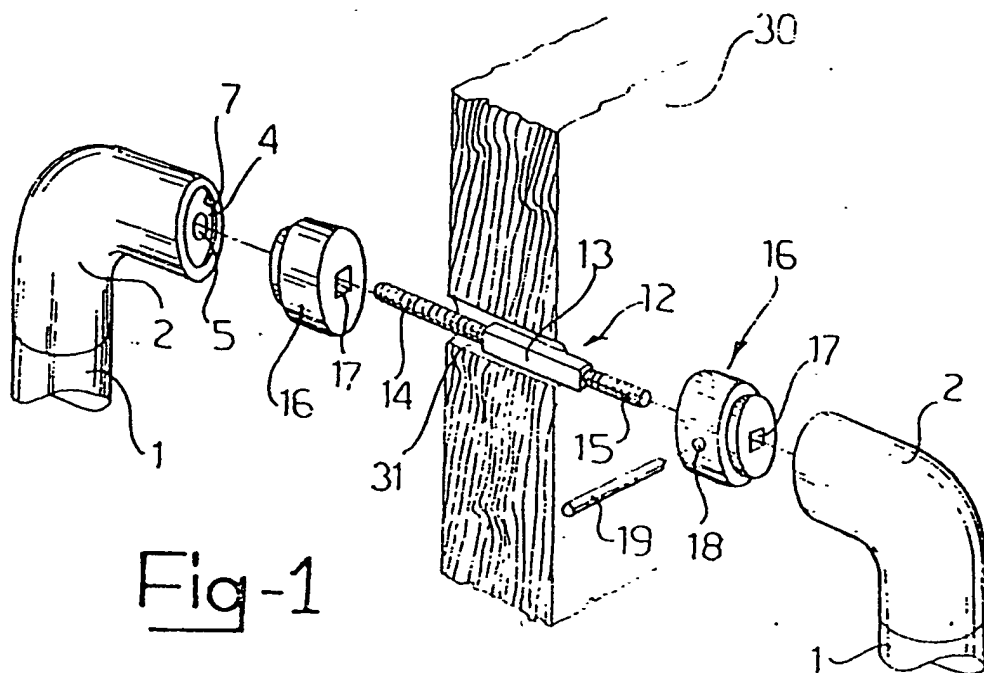


Fig-1

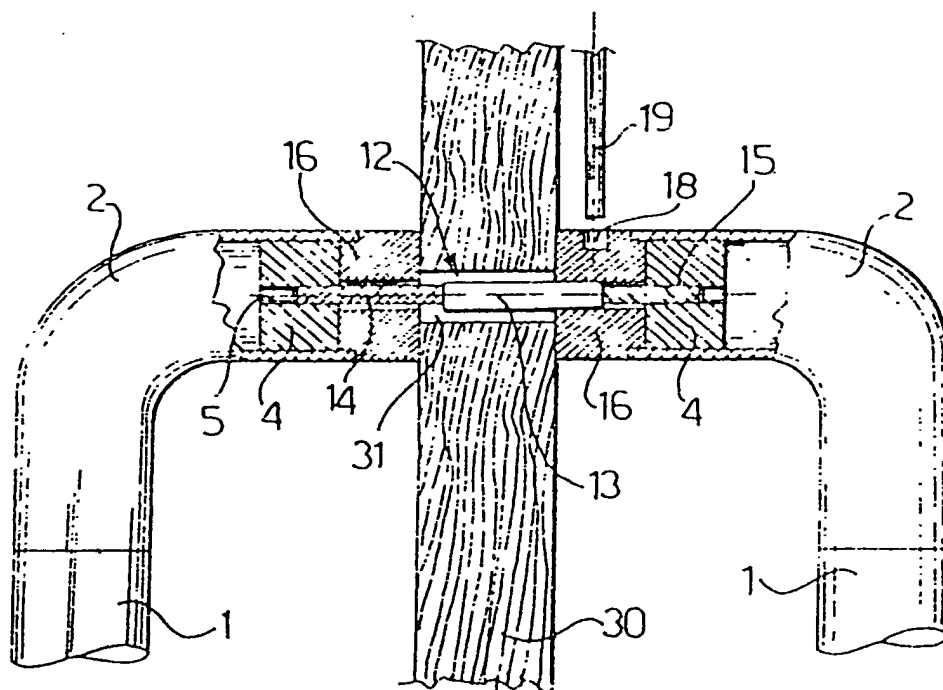


Fig-2

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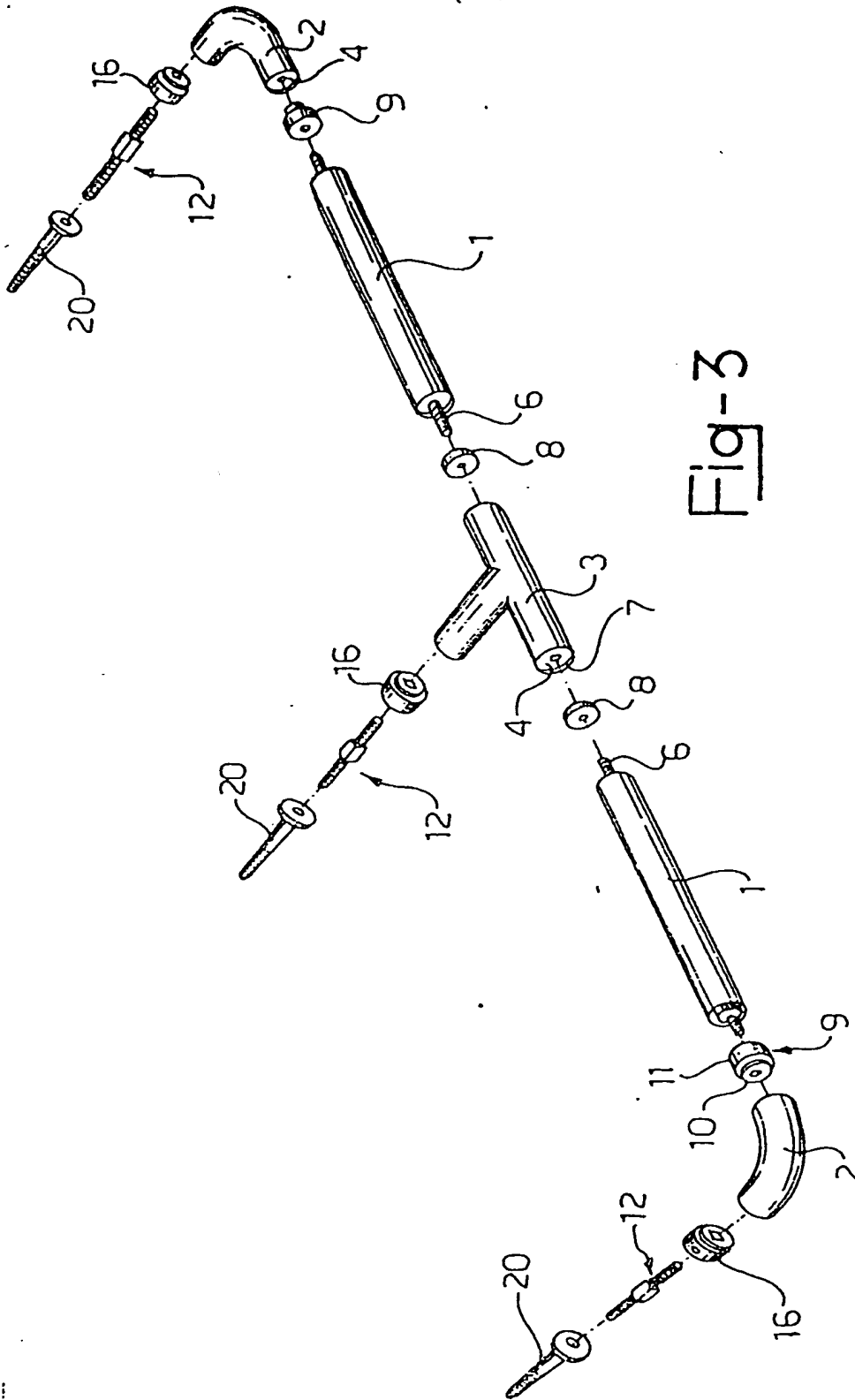


Fig-3

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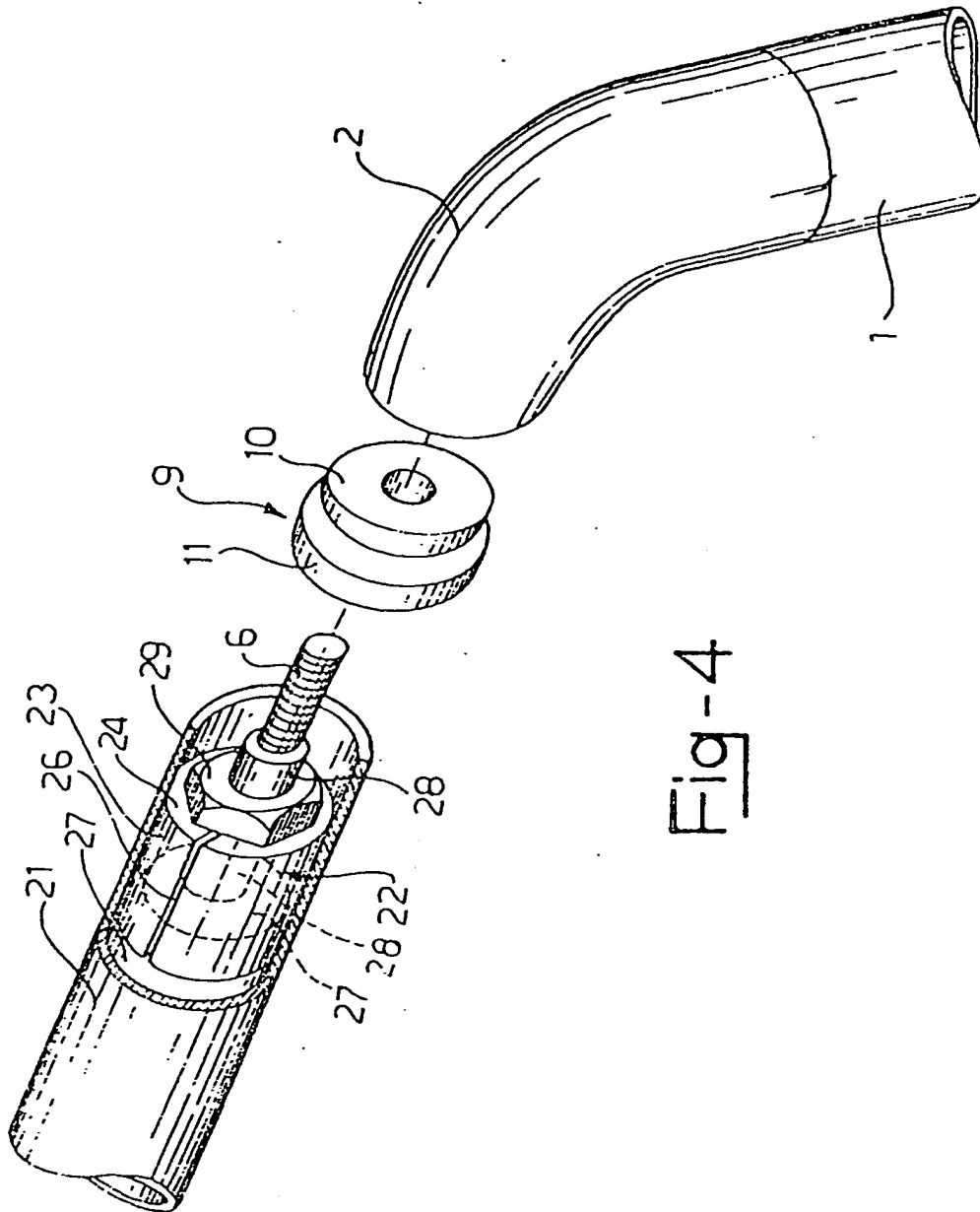
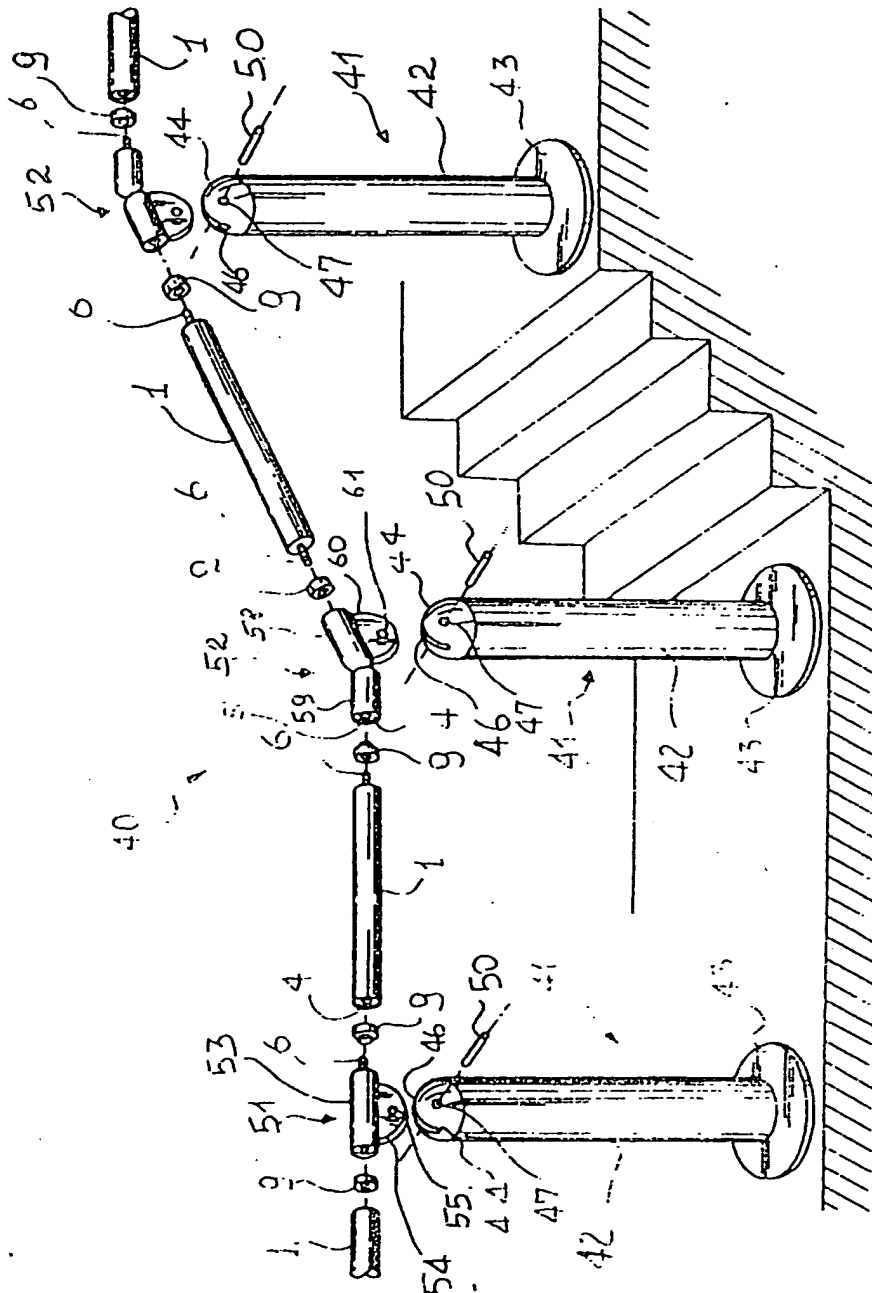


Fig-4

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1.1

## SPECIFICATION

**A kit for making composite tubular structures such as handrails and the like, with concealed joints**

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The present invention relates to a kit for making composite tubular structures, such as handles, hand rails and the like, with concealed joints.

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In recent years there has been very widespread use of "do it yourself" technology, that is the marketing of articles which are simpler to assemble than equivalent, conventional articles, and which are sold in the pre-assembled state and are then completed and/or installed by the user. These operations may be carried out without specific technical preparation.

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There are however products, such as those in the specific technical field of this invention, for which, until now, there has been no alternative to the use of specialised personnel for their assembly.

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By way of example, the assembly and putting into use of a conventional tubular-metal handrail requires the carrying out of special operations such as the cutting, welding, grinding, etc. of the structural elements of which they are made.

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These operations, because of their intrinsic difficulty and the kit required, are difficult to carry out by inexperienced personnel.

It must also be remembered that this type of tubular structure, as well as being functional and strong, must also fulfil certain aesthetic criteria which make the accuracy of assembly even more important.

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The object of the invention is to provide a kit for making handles, handrails and the like with structural characteristics such as to make it possible for a person without any specific technical knowledge and specialised equipment to assemble them and put them into use.

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This object is achieved by a kit for making composite tubular structures comprising a plurality of tubular elements, of which at least one is straight, at least one is of elbow shape and at least one is of T-shape, a plug fixed in each end of each tubular element and provided with an axial threaded aperture, a plurality of threaded bars for engaging in the threaded apertures in the plugs to connect the tubular elements in abutting relation, at least one tie rod with oppositely threaded ends and an operating ring rigid for rotation with the or each tie rod.

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The characteristics and advantages of the invention will become more apparent from the detailed description of several examples of tubular structures made with such a kit and shown in the accompanying drawings in which:

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*Figure 1* is a partially-exploded perspective view of a pair of handles made with a kit

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according to the invention and mounted on opposite sides of a door;

*Figure 2* shows the handles of *Fig. 1* in partial section;

*Figure 3* is an exploded perspective view of a handrail formed by a kit according to the invention;

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*Figure 4* is a partially-sectioned perspective view of a detail of the kit according to the invention; and

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*Figure 5* is an exploded perspective view of a second handrail made with a kit according to the invention.

In the accompanying drawings, a straight tubular element is indicated at 1, an elbow element is indicated at 2 and a T-shaped element is indicated at 3.

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All the elements 1, 2, 3 have plugs 4 firmly fixed within their free ends.

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Each plug 4 has an axial, threaded aperture 5 for engaging a threaded bar 6 for connecting two adjacent tubular elements in abutment with each other.

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In the embodiment illustrated, each plug 4 is so fitted into the corresponding tubular element as to form a seat 7 for receiving a centering ring 8.

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The ring 8 has a central aperture and an outer diameter equal to the inner diameter of the corresponding tubular element and a thickness substantially equal to twice the axial depth of the seat 7.

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A spacer 9 is shown which has two axially-adjacent cylindrical portions indicated 10 and 11 respectively.

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The portion 10 has an outer diameter equal to that of the ring 8 and is intended, during assembly, to engage one of the seats 7 while the portion 11 has an outer diameter equal to that of the tubular elements 1, 2, 3 so that, in the assembled structure, there are no dimensional discontinuities between the spacer 9 and the elements 1, 2 and 3.

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The kit according to the invention further includes a tie rod 12 having an intermediate prismatic portion 13 and end portions 14 and 15 respectively formed with screw threads of opposite hand, for example a right-hand and a left-hand thread respectively.

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The intermediate portion 13 of each tie rod 12 is releasably coupled to an operating ring having an external configuration similar to that of the spacer 9 but with an axial hole 17 of polygonal section. The intermediate portion 13 of the tie rod 12 is housed within the hole 17 whereby the operating 16 and the tie rod 12 are coupled together for rotation with each other.

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A radial hole 18 is formed in the operating ring 16 to receive an operating pin 19 used to rotate the ring 16 and its tie rod 12.

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With particular reference to *Fig. 3*, a plurality of tie rods 12 is used, in cooperation with screws 20 for fixing a handrail to a wall, the handrail having a tubular structure according to

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the invention.

In order to make specific structures, the kit described above may be augmented by tubular pieces 21 (Fig. 4) cut to required lengths by

the user; the plugs 4 are in this case replaced by expansion members 22 housed within the opposite ends of the offcuts 21. Each member 22 has a tubular cylindrical body 23 closed at one end by a wall 24 and provided with one or more axially-extending notches 26.

A frusto-conical stopper 27 provided with a threaded shank portion 28 extending axially from its smaller end is partially inserted in the body 23 with the shank portion extending through the end wall 24.

The shank portion 28 is formed with a threaded, axial bore to receive one of the threaded bars 6; a nut 29 is rotatable on the shank portion 28 in engagement with the end wall 24 to draw the stopper 27 further into the body 23 and hence to expand the body forcibly against the inner wall of the tubular portion 21.

The assembly of the elements according to the invention and their fixing to a wall is particularly simple. In Figs. 1 and 2 one example of the assembly of two opposing handles on a door 30 is shown.

The door 30 has a through-hole 31 in which the tie rod 12 is so inserted that part of the prismatic portion 13 projects from one side of the hole 31.

Each handle is formed from a straight tubular section 1 and at least one elbow section 2 to the free seat 7 of which is fixed an operating ring 16.

Of the two rings 16, only that engaged over the prismatic portion 13 projecting from the hole 31 acts on the tie rod 12.

The clamping of the two handles against the door 30 is achieved by rotation of the last-mentioned operating ring 16 by means of the pin 19 so that the tie rod is screwed into the opposing plugs 4.

Fig. 5 illustrates part of a handrail 40 of simplified structure formed by means of a kit according to the invention.

Details similar to those described with the reference to the preceding figures are indicated by the same reference numerals.

The kit for making the handrail 40 includes a plurality of straight, tubular elements 1 provided at opposite ends with plugs 4 with threaded apertures, a plurality of threaded bars 6 and a plurality of spacers 9.

The kit further includes a plurality of uprights 41 having cylindrical bodies 42 to opposite ends of which are fixed flanges 43, acting as bases for the uprights 41, and hemispherical caps 44 respectively.

A notch 46 is formed in the top of each cap 44 and extends therethrough in a diametral plane passing through the vertical axis of the corresponding upright 41.

A through hole 47 is formed in the cap 44 with its axis perpendicular to the plane of the notch 46 and intersecting the notch 46. A pin 50 is releasably inserted within the hole 47.

The kit of Fig. 5 further includes a series of rigid connector elements 51 and a series of jointed connector elements 52.

The connector elements 51 (only one of which is shown in Fig. 5) each comprises a tubular portion 53 having opposite ends provided with plugs 4. A semi-circular appendage 54 provided with a through hole 55 is welded along a generatrix of the portion 53 and is intended to be inserted in the notch 46 of a corresponding upright 41 and to be fixed therein by means of the pin 50 which is inserted through the holes 47 and 55. The connector element 51 is thus pivotally connected to the top of the corresponding upright 41.

The jointed connector elements 52 each include two tubular portions indicated at 58 and 59 respectively connected together end to end by means of a ball joint (not shown) of conventional type.

The tubular portions 58, 59 have plugs 4 at their free ends, each plug having an axial threaded hole 5, and one of the tubular portions, for example the portion 58, has a half-moon semi-circular appendage 60 welded along one of its generatrices and traversed by a hole 61.

The appendage 60 is intended to be housed in the notch 46 of an upright 41 to be fixed therein by means of a pin 50 inserted through the holes 47 and 61. The connector element 52 is thus also pivotally connected to the top of an upright 41.

With the connector elements 51 and 52 fixed to the uprights 41, the handrail 40 is assembled by connection of the tubular elements 1 to the free ends of the tubular portions 53, 58 and 59 by means of the threaded bars 6.

The invention thus achieves its stated object and also possesses numerous other advantages among which are considerable strength and the pleasing aesthetic appearance of the composite tubular structures formed.

## 115 CLAIMS

1. A kit for making composite tubular structures comprising a plurality of tubular elements, of which at least one is straight, at least one is of elbow-shape and at least one is of T-shape, a plug fixed in each end of each tubular element and provided with an axial threaded aperture, a plurality of threaded bars for engagement in the threaded apertures in the plugs to connect the tubular elements in abutting relation, at least one tie rod provided with oppositely threaded ends and an operating ring rigid for rotation with the or each tie rod.

2. A kit according to Claim 1, in which each plug is inset into the end of a tubular

element so as to form a seat for receiving a centring ring or a spacer.

3. A kit according to Claim 2, in which the spacer comprises first and second axially-adjacent cylindrical portions, the first portion having an outer diameter equal to the inner diameter of said seat while the second portion has an outer diameter equal to the outer diameter of the tubular elements.
4. A kit for making composite tubular structures comprising a plurality of tubular elements of which at least one is a connector element in the form of a tubular portion welded to an apertured appendage, and at least one is a straight portion, a plug fixed within each end of each tubular element and provided with an axial threaded hole, a plurality of threaded bars for engaging the threaded holes in the plugs to connect the tubular elements in abutment with each other and at least one upright element having a flanged lower end and an upper end which is releasably connected by a hinge to the apertured appendage on the or each connector element.
5. A kit according to Claim 4, in which each plug is inset in the end of a tubular element to form a seat for receiving a centring ring or a spacer, the spacer including first and second axially-adjacent cylindrical portions, the first portion having an outer diameter equal to the inner diameter of the seat while the second portion has an outer diameter equal to the outer diameter of the tubular elements.
6. A kit according to Claim 4 or 5, in which the or each connector element comprises two tubular portions interconnected end to end by means of a ball joint and provided at opposite free ends with the plugs.
7. A kit according to any one of Claims 4 to 6, in which the upper end of each upright member is formed with a notch and through-hole extending transversely of the notch, and a pin is releasably engaged in the through-hole and in a hole formed in the appendage of a connector element.
8. A kit for making composite tubular structures substantially as hereinbefore described with reference to and as shown in the accompanying drawings.



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